Reg. No.............................. Name.................................... U625

B. Sc. DEGREE END SEMESTER EXAMINATION MARCH 2017

SEMESTER **– 6: MATHEMATICS (CORE COURSE)**

COURSE: **U6CRMAT11: DISCRETE MATHEMATICS**

(For Regular - 2014 Admission)

Time: Three Hours Max. Marks: 75

PART A

Answer **all** questions. Each question carries 1 mark.

1. Define a regular graph.
2. Draw all simple graphs with two vertices.
3. Find the number of edges in $K_{4,5}$.
4. Draw a Hamiltonian graph which is not Euler.
5. Give an example of a graph with cut edge but no cut vertex.
6. Draw K_5 and mark a maximum matching in the graph.
7. Encrypt the message RETURN HOME using Caesar cipher.
8. Write a super increasing Knapsack problem.
9. Define a chain.
10. State the Consistency law in lattice.

(1 x 10 = 10)

PART B

Answer **any eight** questions. Each question carries 2 marks.

11. State and prove first theorem of graph theory.
12. Obtain Adjacency matrix of K_5.
13. Draw a graph which is not Euler but having an Euler trial and write the Euler trial.
14. Prove that it is impossible to have a group of nine people such that each one knows exactly five others in the group.
15. How many different perfect matching are there for the graph $K_{n,n}$ for each n ≥ 2? Justify your answer.
16. Draw all trees with six vertices.
17. Encipher the message HAVE A NICE TRIP using Vigenere cipher with keyword MATH.
18. Obtain all solutions of the Knapsack problem $2x_1 + 3x_2 + 5x_3 + 7x_4 + 9x_5 + 11x_6 = 21$.
19. Draw the lattice diagram of factors of 20 under divisibility.
20. Show that is any Lattice idempotent laws follow from absorption laws.

(2 x 8 = 16)

PART C

Answer **any five** question. Each question carries 5 marks.

21. Show that an edge e of a graph G is a bridge if and only if e is not part of any cycle in G.

22. Show that a connected graph is Euler if and only if degree of every vertex is even.

23. If T is a tree with n vertices prove that it has precisely n-1 edges.
24. Prove that k- regular bipartite graph with k > 0 has perfect matching.
25. Let ‘e’ be an edge of a graph G prove that W(G) = w(G-e) w(G) +1.
26. Decrypt the message RXQTGU which has enciphered by linear cipher c = 3p+7.
27. If (P, ≤) is poset with greatest element u such that every nonempty subset S of P has infimum then prove that P is a complete lattice.

(5 x 5 = 25)

PART D

Answer **any two** questions. Each question carries 12 marks.

28. a) Prove that a non-empty connected graph G is bipartite if and only if it has no odd cycles.
b) If C (G) is complete then show that G is Hamiltonian.
29. Show that a matching M in a graph G is a maximum matching if and only if G contains no M-augmenting path.
30. A user of Knapsack cryptosystem has a private key consisting of the super increasing sequence
2, 3, 7, 13,27. Modulus m = 60 and multiplier a = 7.
(a) Find the user’s listed public key.
(b) With the aid of this public key encrypt the message SEND MONEY.
31. (a) Prove that dual of a lattice is a lattice.
(b) Prove that a sub lattice S of a lattice L is a convex sub lattice if and only if for every a, b element of S with a ≤ b, [a, b] ⊆ S.

(12 x 2 = 24)

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